IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application No.:	09/498,821
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Applicant:	Lutkus et al.
Group Art Unit:	3627
Examiner:	Flemming Saether
Title:	Anti-Galling Fastener Inserts
Attorney Docket:	0275M-000273

AFFIDAVIT – RULE 1.132

STATE OF CONNECTICUT)
) SS:
COUNTY OF FAIRFIELD)

I, WILLIAM GIANNAKAKOS, being duly sworn, depose and say that I am an inventor of the above-referenced patent application and that I am familiar with the development, manufacture, usage, and properties of helically coiled wire inserts. My technical knowledge comes from over thirty years of experience in various engineering and manufacturing disciplines, including the fields of machine tool and fastening systems. For the past twenty years, I have been involved in and developed expertise in the design, development, and manufacturing of helically coiled inserts.

I was formally educated at Western Connecticut University where I received a Bachelors Degree in Industrial Management. I am a current five year member of the Society of Automotive Engineers (SAE) and the American Society of Mechanical Engineers (ASME). I have been a technical advisor to the National Aerospace

Standards Committee and the SAE E-25 committee for propulsion systems for over five years and I have been serving as the technical liaison between the two organizations for the past two years. Further, I was a contributing senior member of the Society of Manufacturing Engineers (SME) for fifteen years.

BACKGROUND INFORMATION

Helically coiled wire inserts are widely used in many industries to strengthen the connection between fasteners and respective substrates. Specifically, tapped threads are strengthened due to the inherent flexibility of such helically coiled wire inserts provide a more balanced distribution of dynamic and static loads throughout the length of thread engagement. The flexibility also compensates for variation in lead and angle error. Since helically coiled inserts generally do not exhibit staking, locking or swaging and do not require keying in place, helically coiled wire inserts greatly reduce stresses which would otherwise be transferred to the receiving substrate.

Due to the intimate connection between the threads of fasteners and the insert, shearing forces are exerted on the fastener insert upon attachment of the fastener. As a result of the shearing forces, fastener inserts formed from 302/304 type stainless steels have exhibited a propensity to gall despite such stainless steels being considered among the hardest in the industry. Consequently, there is a need for high strength fastener inserts which are resistant to galling.

STATEMENT

Upon review of U.S. Patent Nos. 5,860,779 by Toosky; 4,563,119 by Cosenza and 3,912,503 by Schumacher, it is my opinion that one of ordinary skill in the art would not consider the proposed combination and further would not be able to produce the

present invention. Many of the obstacles that have prevented others from developing our invention and a description of how we were able to overcome these obstacles is provided below.

In order to develop our invention, an extensive number of materials having known anti-galling characteristics were identified. Once identified, we attempted to form, test and evaluate fastener inserts from materials known to have anti-galling characteristics to insure that the materials could meet our performance requirements and be environmentally friendly. After extensive and costly testing, the only material identified that could conceivably satisfy our performance requirements in terms of torque, anti-galling and environmental considerations is that claimed under the present invention. In particular, the material had to offer anti-galling improvement on the order of at least 20% - 25% as compared to 302/304 type stainless steels while at the same time being able to obtain acceptable industry torque requirements.

While the material of the present invention was expected to offer certain anti-galling advantages, in order to achieve the required torque values with a material that had higher lubricity and is generally more brittle than 302/304 type stainless steels, significant changes to our manufacturing tooling as used for 302/304 type stainless steel fastener inserts was necessary.

For example, our coiling mandrel dimensions had to be dramatically modified so as to be able to achieve the required helical insert dimensions needed for proper installation and retention in a substrate. Use of the existing tooling (coiling mandrels, etc.) did not afford us with the ability to successfully coil helical wire inserts made out of the material of the present invention. In particular, the free outside diameter of the

insert in the relaxed state was of a size that was so large that it was impossible to install the insert into the tapped hole of the substrate. This was mainly caused by the variation in the wire spring-back characteristics between the material of the present invention and that of type 304 stainless steel. As a result, the outside diameter of the insert in the relaxed state had to be reduced by at least 15%. This was only achievable by extensive modifications (reductions) to our coiling mandrel pitch, major, and minor diameter dimensions.

Additionally, the coiling speeds had to be adjusted significantly to properly coil fastener inserts formed from the claimed material. For example, in order to coil a 10-32 size helical wire insert made out of 304 type stainless steel, our equipment winds at a rate of approximately 4000rpm. In contrast, the equipment operating speed had to be reduced significantly to effectively manufacture 10-32 size helical wire insert out of the material claimed under the present invention.

Still another manufacturing obstacle that had to be addressed was the propensity of the material to crack at the radium when the wire was bent more than 90 degrees during the coiling process to form the insert tang. The tooling geometry had to be reconfigured to give a larger radius than normally used with type 304 stainless steel in order to address the problem with cracking.

Once we were able to successfully manufacture fastener inserts formed from the claimed material which met our torque and anti-galling objectives, we were surprised to find that the inserts exhibited a significant improvement in yield strength. Higher yield strength which relates to the spring back effect on the coils, results in higher stress on the convolutions of the installed insert. This, in turn, increases the tangential forces on

the flanks of the threads in a tapped hole which precludes movement of the fastener inserts when the fastener is installed.

The mere combination of the teachings of the cited references would not lead to the present invention. As described above, numerous obstacles had to be overcome in order to produce fastener inserts from the claimed material. Further, significant improvements were achieved not only in the anti-galling characteristic of the inserts, but, surprisingly, the inserts exhibited improved yield strength over identically sized fastener inserts formed from type 302/304 stainless steels. In view of the foregoing, we believe our invention is not obvious in light of the cited art.

William Giannakakos

CT Drlc #034710607
exp 03-09-05

On this 2nd day of MAY 2002, before me personally appeared William Giannakakos, known to me to be the person described in and who executed the foregoing instrument, and who thereupon acknowledged to me that he executed the same for the purposes therein set forth.

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